to prevent the death of the plant from starvation. The various conditions of temperature or illumination which affect growth affect the turgor in exactly the opposite manner, so that if growth is retarded turgor rises, if growth is accelerated turgor falls. Turgor is regulated by, rather than regulates, the rapidity of growth.—C. R. B.

THE SEMI-ANNUAL REPORT of Schimmel & Co.,[10] for October 1896, gives special attention to the following topics: Almond oil, which is used extensively to perfume cocoanut oil soaps, is more certain to produce a white soap which will not discolor if it is free from hydrocyanic acid; otherwise most careful attention to temperatures is requisite in the process of manufacture and drying.——The regions of China yielding cassia oil have recently been traversed by O. Struckmeyer, and a map shows their location, which is chiefly in Kwang-si and Kwang-tung, south of the Si or West river, along the parallel of 23° N. and between 110° and 112° E. The oil is distilled from about 70 per cent. of leaves and 30 per cent. of twigs.——Bergamot, lemon and orange oils are discussed, especially in relation to adulterations.——Some interesting figures are given of the peppermint crop in the states of Michigan, Indiana, and New York, which will produce this season nearly 200,000 pounds of oil, of which Michigan produces about two-thirds. The largest peppermint field in the world is in Allegan and Pearl counties, about a mile long. ——The rose fields for which this firm is famous yielded the past season 265,000 kilos of roses, representing about 60 kilos of pure rose oil.—C. R. B.

NOTES FOR STUDENTS.

THE EARLIEST general presentation of the Caryophyllaceæ, that of De Candolle's *Prodromus*, can claim little merit. In fact, it is hard to say whether the treatment of the Alsineæ by Seringe, or of the genus Silene by Otth, shows the greater haste and superficiality. Far more scholarly was the work of Fenzl, who, in his admirable treatment of the Russian and Siberian Alsineæ, in his contributions to Endlicher's *Genera*, as well as in scattered and unfortunately fragmentary papers, shows the first critical insight into the order. Since the time of Fenzl, the most noteworthy contributors to our knowledge of the Caryophyllaceæ have been Rohrbach, Boissier, and Williams. Of these Rohrbach, during his short but active life, completed masterly monographs of Silene and Melandryum, and also prepared the Caryophyllaceæ for the *Flora Brasiliensis*, while Boissier in his *Flora Orientalis* has given very full and accurate descriptions of the numerous Mediterranean and oriental Caryophyllaceæ, his treatment of Silene being especially noteworthy. Of all living writers, however, Mr. Williams has doubtless the broadest

[10] Fritsche Bros., Leipzig and New York.

knowledge of the order, and his long expected monograph[11] of its most difficult genus is a very welcome addition to botanical literature.

The work, which fills nearly 200 octavo pages and recognizes 390 species, is regarded as supplementary to Rohrbach's *Monographie der Gattung Silene*. Species fully treated by Rohrbach are not redescribed, but only enumerated with brief bibliography. Species of later date, however, are well characterized in Latin. In its scientific aspect the work is decidedly British. The species and varieties are of the Benthamian sort, and there is no attempt at the elaborate varietal and formal subdivisions popular with and sometimes inordinately multiplied by continental monographers. Unfortunately *exsiccati* are not cited, which is a considerable defect. Surely the enumeration, under each species and variety, of a very few authenticated specimens would have added much more to the value than the bulk of the work.

One of the most interesting features of Mr. Williams' monograph is the attempt to transfer from Silene to Melandryum a considerable number of American and Asiatic species, chiefly those of Watson, Franchet, and Maximowicz. Recognizing the close affinities of certain large-flowered Silenes to species of Lychnis of the *L. dioica* type, various continental botanists have, since the beginning of the century, sought to unite them as an independent genus, Melandryum, or, as originally spelled, *Melandrium* Röhl. Various combinations of inconstant characters have been devised to limit this natural but ill-defined group, the strongest being the greater inflation of the calyx and the complete absence of the partial septation usual in the capsules of Silenes. While restricted as by Rohrbach to such species as *S. Baldwinii*, *S. Virginica*, etc., the genus Melandryum seemed to have, as to its American representatives, a tolerable habital unity, which gave it a certain *raison d'être*. Mr. Williams, however, by giving up all distinctions except the septation of the capsule, and attempting to apply this consistently, feels himself forced to transfer to Melandryum also a number of species of the characteristic Eusilene type, such as *S. Palmeri*, *S. Lemmoni*, *S. Bernardina*, *S. platyota*, *S. Shockleyi*, and *S. Thurberi*. Large genera, however, are seldom satisfactorily separated upon a single technical character wholly unsupported by habital or geographic differences, and such a separation seems especially ill advised when based, as in this case, upon the presence of a structural survival such as these partial septa, which exhibit all stages of obsolescence. But even if the desirability of such a generic distinction were admitted, the writer could not agree with Mr. Williams in excluding from Silene *S. Lemmoni* and *S. Bernardina*, both of which sometimes exhibit the partial septa, which, on the other hand, are sometimes wanting in *S. multinervia*, a species which Mr. Williams without hesitation retains in Silene. It

[11] WILLIAMS, FREDERIC N.—A revision of the genus Silene. Jour. Linn. Soc. **32**: 1–196.

may be noted that the tricarpellary Melandryum of Mr. Williams differs materially in its limitation from the genus of Röhling, Rohrbach, Garcke, and other continental writers.

Considering the extent of his task and the great number of forms treated, Mr. Williams has described few new species, and those made appear to rest upon strong characters. A few changes of name, which affect our North American species, may be noted. In *S. campanulata* Wats., Mr. Williams takes the commoner broad leaved form as the species and relegates the real type to a new made var. *angustifolia*, a sort of transfer which, if generally practiced, would lead in the end to a very indefinite varietal nomenclature. For, if the type of a species is to be taken, not as that form which was originally described, but that which any subsequent writer may (from abundance of material in his own herbarium or the statement of others) regard as the commonest, agreement will be difficult indeed. The name *S. Cucubalus*, restored by Rohrbach and to be accepted by strict followers of the "Kew rule," is rejected on a combination of what would seem very weak grounds; first, Cucubalus is a generic name, although *S. Armeria* is kept up without question. Then *S. Cucubalus* is said to be pedantic; why more so than various other longer and less euphonious binomials retained, does not appear. Furthermore, it is stated that there is a name, *Cucubalus inflatus* Salisb., three years older than *S. Cucubalus*. What this has to do with the case, it is difficult to understand, for being under another genus this cannot come under the "Kew rule," and if Mr. Williams adopts the continental practice of taking up the earliest specific name, he must be aware that in this case there are earlier ones than that of Salisbury. Finally, the doctrine of usage is brought in to support *S. inflatus*, yet Mr. Williams does not hesitate at another point in his work to replace the well known North American *S. verecunda* by *S. Behrii* Williams, an elevated varietal name never current in any flora.

In the arrangement of species it is hard to see why *S. monantha* Wats., which, if not actually a variety of *S. Douglasii*, must be a near ally, is relegated to § GASTROSILENE, with which it has no close affinity. In a preliminary paper upon the North American Sileneæ, the present writer some years ago suggested that *S. purpurata* Greene, of which no authentic material was then at hand, "appeared to be near *S. Scouleri*." It is accordingly a surprise to find *S. purpurata* placed under *S. Scouleri* "*ex* B. L. Robinson," while as a matter of fact the type of *S. purpurata*, kindly loaned by Professor Greene, has proved on examination identical with the Siberian *S. repens* Patr. *S. Hallii* Wats., upon which (together with the ill-starred *S. purpurata* Greene) Mr. Williams bases his *S. Scouleri* var. *costata*, differs from *S. Scouleri* in range, habit, and inflation of the calyx, so that its specific separation by Dr. Watson seems fully warranted.

In giving geographic ranges in the New World, Mr. Williams is, to put it mildly, very un-American. For instance, to *S. Menziesii* the following extraordinary habitat is assigned: "The mountains of N.-W. America from Oregon Territory; Vancouver's Island, the Rocky mountains, and the Black Hills as far as Slave Lake; and in the United States from Vancouver's Island to Colorado, South California, and New Mexico." *S. Scouleri*, however, seems to have received a still more remarkable range, its *northern* and *western* limits being given as Vancouver's Island and British North America, and its *eastern* and *southern* limits as the Caucasus. The writer would express some doubt as to the identity of the Asiatic specimens, but even if this point is waived, it is still evident that Mr. Williams has gone around the world the wrong way! A similar lapse of clear thought is shown by the highly infelicitous name "subacaulescens" for a somewhat caulescent form of the usually stemless *S. acaulis*.

However, the few points for criticism here enumerated, and some others which might be mentioned, affect only a small part of this generally admirable paper, and Mr. Williams is to be congratulated upon the completion of a difficult monographic task and the production of a useful work abounding in clear distinctions and excellent descriptions.— B. L. ROBINSON, *Harvara University*.

MR. W. C. WORSDELL has studied the anatomical structure of the stem of *Macrozamia Fraseri*,[12] a genus which has not been investigated heretofore. Our previous information concerning the stem structure of cycads has been derived from studies of the genera Cycas, Encephalartos, and Stangeria. In these genera certain so-called "anomalous" structures were discovered which have excited considerable interest, especially in view of their possible phylogenetic significance. The examination of a single old decaying stem of a single species of Macrozamia may not form a proper basis for much safe generalization, but Mr. Worsdell has found enough in it to be worthy of record. A striking feature of the stem structure is the occurrence in the pith of a dense network of vascular bundles, a condition of things heretofore recorded only in Encephalartos. This anastomosing system traverses the pith in every direction, the course of each bundle apparently being determined by the fact that it is a constant attendant of a mucilage canal, which is a branch of a similar anastomosing network of mucilage canals. The orientatation of these vascular bundles is by no means regular with reference to the periphery of the stem, but is determined by the mucilage canals, toward which the phloem is constantly directed. As the canal twists and bends through the pith the bundle accompanies it, appearing first on one side and then on the other, sometimes giving rise to curious contortions of the vascular elements. Certain smaller branches of this vascular network

[12] Ann. Bot. **10**: 601–620. *pl. 27, 28.* 1896.

were observed to enter the medullary rays and pass outwards, accompanying mucilage canals, the xylem and phloem elements joining the corresponding regions of the primary zone, the mucilage canals passing on to join the canal system of the cortex. As would be expected, this vascular system of the pith is strictly cauline, the mucilage canals appearing unattended near the apex, while farther down the accompanying vascular elements are gradually differentiated.

Another cycadean peculiarity, known heretofore in Cycas and Encephalartos, is the occurrence of a succession of secondary zones of vascular strands outside of the primary leaf-trace zone, formed by successive meristem zones developed in the pericycle. In Macrozamia these secondary zones are strongly developed, the first one being as prominent as the normal one, the subsequent ones rapidly diminishing in size. The strands of the secondary zones have the same orientation as those of the primary zone, the xylem of each zone abutting almost directly upon the phloem of the next inner one. What Mr. Worsdell apparently regards as a capital discovery, however, is the detection of an occasional "tertiary cambium," by which he means that between the primary and first secondary zones, or between successive secondary zones, small intermediate bundles are occasionally developed. The remarkable thing about them, however, is their reversed orientation, the xylem being directed outwards, towards the xylem of the outer zone. This position occasionally results in an appearance so suggestive of a concentric bundle that the author associates with it the well known cortical concentric bundles of Cycas, and suggests a possible method of the derivation of the collateral bundle from the concentric. He sees in these "anomalous structures" of cycadean stems the "remnants of some ancient structure once common to a large group of plants," this ancient structure consisting of "rings or layers of concentric vascular strands." Later, the meristem of the inner portion of each concentric strand gradually became less and less functional, that of the outer portion became more and more active, and the collateral bundle was developed. These rings of ancient concentric bundles are still seen in the cortex of Cycas, and the reduced inner portions of the concentric bundles are seen in the small intermediate bundles of Macrozomia with reversed orientation. This hypothesis will be tested, not only by further examination of living cycads, but also by an investigation of the structure of numerous fossil forms which are either cycads or show cycad affinities.—J. M. C.

DR. D. H. CAMPBELL a year ago described in this journal[13] a new genus of liverworts, to which he gave the name *Geothallus tuberosus*. It is a low type, and agrees with Sphærocarpus more nearly than with any other known form. These two genera, along with Riella and Thallocarpus, constitute the lowest group (Anelatereae) of the anacrogynous Jungermanniaceae, all agree-

[13] BOT. GAZ. 21:9–13. *pl. 2.* 1896.

ing in the absence of perfect elaters, which are replaced by thin-walled chlorophyll-bearing cells. Dr. Campbell has now published an account[14] of the development of his new genus, showing that it agrees with Sphærocarpus in the form of the apical cell and in the general position and structure of the sex organs, particulars in which both genera resemble Riccia; and that it differs from it in its much more massive thallus, in its second division in the antheridium and the massive stalk of that organ, in its sessile archegonium and consequent deeper penetration of the foot of the embryo into the thallus, in the large size and complete separation of the smooth spores, and in the development of true leaves and tubers. In the judgment of the author Sphærocarpus remains the most primitive type, and Geothallus is intermediate between it and forms like Fossombronia.—J. M. C.

THERE HAS BEEN much discussion as to the origin of the droplets of sweet secretion which fall from trees in midsummer, sometimes in such abundance as to cover the pavements, and especially the twigs and lower leaves. In 1884 Boudier concluded that it was wholly of animal origin. In 1891 Büsgen in his important memoir on honeydew seemed to support this view, though he discussed only the sweet secretion produced by insects. But various botanists, apiculturists, and entomologists had pointed out clearly a twofold origin of honeydew. M. Gaston Bonnier has reinvestigated the question both by observation and experiment. He comes to these conclusions.[15]

Honeydew, while more commonly the product of Aphidæ and Coccinellidæ, is also of plant origin, as may be demonstrated by direct observation of the sweet droplets as they appear at the stomata. The animal honeydew appears during the day, the plant during the night, with a maximum at daybreak. The conditions which favor its production are cool nights and hot dry days. Increased moisture in the air and cloudiness also favor it, other things being equal. Severed branches plunged in water, with the leaves shaded and in a saturated atmosphere, will produce honeydew at the stomata, even when those on the tree are not doing so. The plant honeydew approaches in chemical composition more nearly the nectar of flowers than it does that of aphides.—C. R. B.

THE Protophyta have received a new systematic treatment, the result of recent study by Professor C. E. Bessey.[16] He divides them into the two orders Cystiphoræ and Nematogenæ, composed of unicellular and filamentous forms respectively. Further, the "bacteria" are not considered a distinct family, the author not regarding the hysterophytic habit, as contrasted with

[14] Ann. Bot. **10**: 489–510. *pl. 24, 25*. 1896.

[15] Revue général de Botanique **8**: 1–22. 1896.

[16] The systematic arrangement of the Protophyta. Amer. Nat. **31**: 63. 1897.

holophytic, of so great taxonomic value as differences of structure. Green and colorless species should in some cases be put together, even within the limits of the same genus, as the author does in the case of Schizothrix, for example. Six families are recognized, the "bacteria" occurring in three of them, but the great majority are included in the second, the Oscillariaceæ.—J. G. C.

IN THE CONTINUATION of his studies upon flowers and insects,[17] Mr. Charles Robertson has presented results obtained from investigations of Hepatica, Asimina, Podophyllum, Solea, Euonymus, Æsculus, Astragalus, Stylosanthes, Gymnocladus, Spiræa, Gillenia, Viburnum, Symphoricarpos, Aster, Silphium, Heliopsis, Rudbeckia, and Cacalia.

In this same connection it may be noted that Mr. J. Lloyd Williams[18] has called attention to the intoxication of bumblebees by the nectar of certain "capitulate" plants (Centaurea and Carduus), and suggests that their helpless rolling covers them effectually with pollen, which upon their recovery is carried to other heads.—J. M. C.

ITEMS OF TAXONOMIC INTEREST are as follows: Mr. E. B. Uline has published a revision of the Mexican and Central American species of *Dioscorea*.[19] Mr. George Massee has redescribed many of the Berkeley types of fungi.[20] Mrs. E. G. Britton has enumerated[21] the Bolivian mosses collected by H. H. Rusby in 1885–6, among which are 42 species either new or previously undescribed. Mr. E. P. Bicknell has published an account of the North American species of *Agrimonia*,[22] in which he shows that *A. Eupatoria* L., not known as an American plant, has long given its name to a group of related species, five of which he characterizes, reviving old names in every case excepting for *A. Brittoniana*. Dr. T. F. Allen has described three new species of *Nitella*,[23] two from Japan, and one from Indian Territory. Professor E. L. Greene, in his last fascicle of studies,[24] discusses *Cardamine* and *Dentaria*, suggesting a new definition of the genera; proposes a new cruciferous genus, *Schœnocrambe*, based upon plants that have been referred variously to Nasturtium, Sisymbrium, and Erysimum; considers the generic name *Erysimum* untenable and substitutes for it the name *Cheiranthus*, renaming the species; discusses further the acaulescent violets; and con-

[17] Trans. St. Louis Acad. Sci. 7: 151–179. 1896.
[18] Jour. Bot. **35**: 8–11. 1897.
[19] See under MINOR NOTICES, p. 132.
[20] See under MINOR NOTICES, p. 133.
[21] Bull. Torr. Bot. Club **23**: 471–499. 1896.
[22] Bull. Torr. Bot. Club **23**: 508–523. *pl. 282–283*. 1896.
[23] Bull. Torr. Bot. Club **23**: 533–536. *pl. 284–286*. 1896.
[24] Pittonia **3**: 115–149. 1896.

structs two new asteroid genera of Compositæ, *Oreastrum* and *Leucelene*, the latter founded upon *Diplopappus ericoides* T. & G. Dr. E. Koehne has published an account of the genus *Philadelphus*,[25] of which thirty-three species are recognized, twenty of which belong to the flora of North America and Central America. A new species from Mexico is described, and two from "western North America," while *P. grandiflorus* of American authors is identified with *P. latifolius* Schrad. The species hybridize freely, and a large number of such cases is recorded. Mr. William Fawcett has published a synoptical arrangement of the Melastomaceæ of Jamaica,[26] a family represented by eighteen genera and over fifty species. M. A. Franchet continues his publication of numerous new species of Chinese Compositæ, among which there recently appears a new genus, *Stereosanthus*,[27] apparently intermediate between Inuloideæ and Senecionidæ. A new Californian *Trifolium* has been described by Mr. W. C. Blasdale.[28] Dr. W. A. Setchell has published a second fascicle of his "Notes on Cyanophyceæ."[29] A plate and an account of *Sisyrinchium Californicum*, growing in Ireland, has been published by Mr. A. B. Rendle.[30] Students of fresh water algæ will welcome the appearance of the first installment of Welwitsch's African collection, by W. West and G. S. West,[31] among which are numerous new species. Mr. L. H. Pammel and Professor F. Lamson-Scribner have published notes upon a collection of grasses collected in 1895 between Jefferson, Iowa, and Denver, Colo.[32] Mr. L. H. Pammel has also published some notes upon the flora of western Iowa.[33] Mr. F. L. Fernald has published an account, with plate, of *Aster tardiflorus* L.,[34] previously discussed by him in this journal.[35]—J. M. C.

AT ONE TIME the anatomical changes induced in climbing organs by the pressure of the support, and the pull exerted by the weight of the plant, were supposed to be coincident or causal to curvature, instead of consequent upon it. Tendrils, climbing branches, climbing hooks, and twining stems have been previously examined, and Dr. von Derschau has recently extended the work to include a number of twining petioles.[36] Twining petioles are not so

[25] Gartenflora **45**: 450–461. 1896.
[26] Jour. Inst. Jam. **2**: 268–277. 1896.
[27] Jour. de Botanique **10**: 384. 1896.
[28] Erythea **4**: 187. 1896.
[29] Erythea **4**: 189–184. 1896.
[30] Jour. Bot. **34**: 494. 1896.
[31] Jour Bot. **35**: 1–7. 1897.
[32] Proc. Soc. Prom. Agric. Sci. 1896.
[33] Proc. Iowa Acad. Sci. **3**: 106–135. 1895.
[34] Garden and Forest **10**: 14. 1897.
[35] BOT. GAZ. **21**: 275. 1896.
[36] Einfluss von Kontakt und Zug auf rankende Blattstiele. Inaugural-Diss., 36 pp. 2 col. lith. plates. No date. Leipzig.

highly irritable as tendrils, though they approach the less sensitive forms in sensitiveness. Petioles of Tropæolum encircled a support in five hours, Lophospermum in eleven hours, Clematis and Solanum in fourteen hours. The contact curvatures are often opposed by the heliotropic reaction of the leaf. Under such conditions a petiole of Lophospermum consumed forty hours in encircling a support.

The morphologically upper side of the petioles of Solanum, Lophospermum, and Tropæolum, and the lower side of Clematis showed the greatest degree of irritability.

In his comparisons the author assumes a latent period of fifteen to thirty minutes for tendrils, which in reality react in ten to fifteen seconds.

The limited transmission of impulses in tendrils is duplicated in petioles. Curvatures, according to the author's measurements, are due to an accelerated growth of the convex side. The portion of the petiole in contact with a support undergoes great increase in thickness, and if the mechanical system is in the form of a crescent or open ring, it is closed.

Stretching tension exerts an influence upon twining petioles similar to that of typical organs. Stretching tension acting upon the encircling part of the petiole in some instances induced in some species an exaggeration of the contact effect, and in others a diminution.

This paper has but recently reached the hands of the reviewer, and bears no date of imprint. Reference is made to a work published in 1892, and the reader has no means of determining the time of publication within five years.—D. T. MacDougal.